LOUISIANA conservationist

JULY-AUGUST 1974

...comments

J. Burton Angelle, Director

I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country—its soil and minerals, its forest, waters and wildlife.

Outdoorsmen—hunters and fishermen—have always helped lead the way in the conservation and preservation of our environment. Long before ecology had become a catchword in the national press, America's outdoorsmen had accurately sensed and, in many cases, foretold the impending threat to our nation's animal species and to our wilderness areas. This was as true in Louisiana as anywhere in the country, and our state's hunters and fishermen have made many valuable contributions to the maintenance of a high quality wilderness environment in Louisiana.

But summer is a time of intense outdoor recreational activity for most Louisiana outdoorsmen — particularly fishermen, of which I am one—and their families, and in such a period of relaxation and enjoyment, we all tend to forget and become a little careless. Perhaps this "forgetfulness" explains why I have been noticing on some of my recent fishing trips, (as perhaps you have, too), an increase in the amount of litter—cans, styrofoam cups, bottles of all sorts, and just plain trash—along some of my favorite waterways.

Sometimes, fishermen (and I include myself in this) are not as mindful as they should be of the effects a careless moment or two can have on the quality of our wilderness and water environment. Take for example, the wrappings that so much of our fishing gear comes in. Did you know that most of those clear plastic boxes or packages containing lures and artificial worms are virtually indestructible? Plastic is among the least bio-degradable of substances, and the chances are that if you toss a half dozen lure boxes around your favorite launching site instead of placing them in waste containers, those same boxes will still be lying around when you return there a week, a month, or even a year later. Plastic boxes and covers and cellophane wrappers are unsightly additions to our wilderness areas and waterways. Make certain you dispose of all such materials in their proper place—a waste bag carried along for the purpose or ashore in a waste container before you depart.

One of the worst offenders in the plastic line are the little harnesses for six packs of beer and other cold drinks. What fisherman hasn't seen the shore around his favorite fishing spot littered with these imperishable reminders of Man's presence? Either remove the harnesses before you shove off or pack them with you when you return. *Don't* throw them overboard, where they may wash ashore or sink to the bottom and add to the already considerable clutter Man has deposited on the floor of our lakes, streams, and rivers.

And the same goes for beer cans and bottles. Despite what you may have heard, biologists are not at all certain that metallic containers don't actively contribute to the deterioration of the aquatic environment. In fact, just the opposite may be true. *Don't* fill your beer cans and bottles with water and let them sink to the bottom. In many cases, they won't sink at all and will end up washed ashore where they will contribute to the unsightly appearance that already mars even many backcountry waterways. Put all cans and bottles in a waste container carried along for that purpose and haul it out with you.

Do the same with *all* waste wrappings and refuse. If you can take it out in the boat with you, you can bring it back. No matter how light and small the object—bring it back. One of the most indestructible objects yet devised by man is small and almost as light as a feather—I am talking about those little styrofoam coffee cups—and almost every shoreline in fresh or salt water is already liberally spotted with these unfortunately durable containers. Styrofoam cups, plates, and saucers (ditto on similar objects made from plastic) simply will not degrade in any reasonable length of time, if at all. Never throw these objects overboard.

A little common sense in what we do with junk we all haul around with us on fishing trips will go a long way toward preserving both the appearance and the quality of our waterways.

Now I'll go out and try to practice a little of what I preach.

LOUISIANA
conservationist

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EDWIN W. EDWARDS, Governor

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Back Cover by Lloyd Poissenot.

> *I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country—its soil and minerals, its forest, waters and wildlife.*

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By Bill Winn

Bob Dennie

Help Your Dog Live Longer

Heartworms (Dirofilaria immitis) are cardiovascular parasites that afflict large numbers of dogs throughout the Southeast and most of the rest of the United States. Once identified primarily with the Deep South states, heartworms are now causing enormous internal damage and loss of life among the canine population all across the country, the result, most experts say, of the increased interstate movement of prime animals for breeding and hunting purposes. Other experts, including Dr. Reynaldo Gonzales of the Animal Care Department at L. S. U. Medical Center in New Orleans and one of the leading authorities on heartworms in the U. S., say people are simply more aware of the problem than ever before.

If so, some of the credit for the increased public awareness of heartworms in dogs must go to Dr. Gonzales himself and to the staff at the Animal Care Center. When Dr. Gonzales and his fellow scientists in New Orleans began research on the heartworm problem 10 years ago, very little was known about the parasites that annually cause thousands if not millions of dollars of damage to the hearts and lungs of dogs in America. Now a considerable body of information is available on the subject, and, perhaps more importantly, an easily available, apparently 100 per cent effective preventive program has been developed.

You *can* prevent your animal from getting heartworms if he is not already infected, and in this article Dr. Gonzales will tell you how. But first, a look at the scope of the problem in Louisiana:

Heartworms may be present in 85 per cent of the dogs in the New Orleans area and in a high per cent elsewhere in Louisiana. Although many dog owners think they know how to spot heartworm symptoms in their animals, Dr. Gonzales says it is extremely difficult—if not impossible—to detect an infected dog without a bloodtest.

Among the symptoms traditionally associated with heartworms are coughing, listlessness, the animal tiring quickly, loss of weight, anemia, rough hair coat, dermatitis, excessive liquid retention, convulsions (usually due to oxygen starvation), and acute liver or kidney failure. All of these symptoms *may* indicate the presence of heartworms in your dog, and certainly if your pointer or pet is exhibiting any of these symptoms he should be checked thoroughly, and not just for heartworms. Unfortunately, your dog may display no symptoms whatsoever and still be a chronic victim of heartworms, a point most dog owners regularly overlook.

"External symptoms simply don't always show," says Dr. Gonzales, who still speaks with more than a trace of his native Cuban accent. "No matter what anybody tells you, coughing and difficulty in breathing are not always indications of heartworms. A perfectly healthy looking dog can be heavily infested with heartworms, and a terrible looking old cur can check out clean. About all we can say without an examination is the older your dog, the greater the chance that it has the worms."

Heartworms get into the dog's bloodstream as larvae when the animal is bitten by an infected mosquito. In less than a year after the larvae enter the bloodstream, they may work their way into a dog's heart where they grow into spaghetti like mature worms that can cause rapid aging and a painful death. In a mosquito infested, waterfowl and game bird state like Louisiana, where some sportsmen pay hundreds and even thousands of dollars for pointers and retrievers, heartworms are a vexing and often expensive problem.

Lloyd Poissenot

"I hate to have to tell a man that his best dog has a heart full of worms," says Dr. Gonzales, "because by then all we can do is treat the dog and free it of heartworms, knowing it will never be the same dog again. Oh, it'll live to a ripe old age, probably, but it will never be its old self. You see, what happens is that the worms killed in the heart pass into the lungs—that's the only place they can go—and irritate the tissue there. Scars form on the lungs and the dog has difficulty breathing. It's just not the same dog. It would be a lot better—and much less expensive for the owner—if he had kept the animal on a sensible program of prevention. For the hunting dog, *prevention, not treatment,* is the answer."

It might help dog owners to take better care of their animals, and save a lot of money in the process, if they knew more about the worms which plague the canine population of the state and (as a story in the May, 1974 issue of FIELD & STREAM makes clear) the rest of the the nation. Here, briefly, is how Dr. Gonzales outlined the life cycle of *D. immitis:*

"For a dog to get heartworms he must be bitten by a mosquito which has previously bitten another dog with the heartworm larvae in its bloodstream. A mosquito has to have these in itself for about two weeks before it can infect a dog. After an infected mosquito bites a dog, it then takes approximately three months for the larvae to work their way from the skin into the bloodstream and into the heart. In another five to seven months the newly infected dog will begin to show larvae (called microfilariae) produced by adult female worms and the adult worm will be present in its heart. The adult worm is very thin, but females may measure up to 15 inches. I have found more than a hundred such worms in a dog's heart. If this dog is bitten by an uninfected mosquito the mosquito may pick up the microfilariae, and so begin the cycle all over again. Because it takes approximately 10 months for the worms to mature, dogs under one year of age rarely have heartworms."

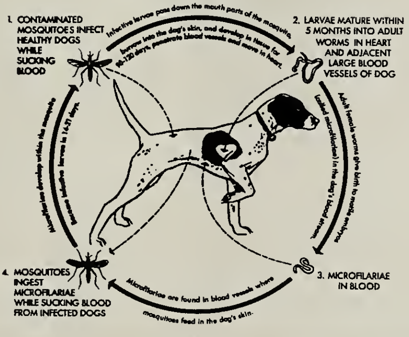
Although hunting dogs, because they are out in the open so much, are primary targets for mosquitoes and, hence, heartworms, Dr. Gonzales warned that all breeds of dogs are susceptible.

"We've had a little 9 pound poodle in here full of heartworms and the dog had practically never even been outdoors. Interestingly, and I haven't kept records or run any tests on this yet so it is just something I have observed myself, black dogs seem more likely to be infected with heartworms than the lighter colored animals. I don't know whether it's because the mosquitoes are attracted to the darker dogs more or what, but it does seem to be true that dark dogs have heartworms more often than light colored dogs. There is some evidence too to indicate that short haired dogs are more susceptible to infection."

If you do not have your dog on a heartworm prevention program, the likelihood of the animal becoming infected is very high in Louisiana. Then the only recourse you have is to pay for long and often quite expensive treatment. If your dog is seven years of age or younger, Dr. Gonzales rates the chance of recovery high, but, as he says, the dog will never be the same again. Treatment means that the mature worms in the heart are killed. This can be accomplished in a number of ways (you can even pay for an expensive operation in which the worms are removed from your dog's heart surgically, a procedure Dr. Gonzales has largely discontinued because of the high incidence of animal fatalities), but here is the procedure Dr. Gonzales recommends:

LIFE CYCLE OF THE HEARTWORM OF DOGS

Dirofilaria immitis


1. CONTAMINATED MOSQUITOES INFECT HEALTHY DOGS WHILE SUCKING BLOOD
Infective larvae pass down the mouth parts of the mosquito,
burrow into the dog's skin, and develop in tissue for 90-120 days, penetrate blood vessels and move to heart.
2. LARVAE MATURE WITHIN 5 MONTHS INTO ADULT WORMS IN HEART AND ADJACENT LARGE BLOOD VESSELS OF DOG
Adult female worms give birth to motile embryos
(called microfilariae) in the dog's blood stream.
3. MICROFILARIAE IN BLOOD
Microfilariae are found in blood vessels where
mosquitoes feed in the dog's skin.
4. MOSQUITOES INGEST MICROFILARIAE WHILE SUCKING BLOOD FROM INFECTED DOGS
Microfilariae develop within the mosquito
become infective larvae in 14-21 days.

Bob Dennie

First, make certain you take your dog to a vet. No one else should be allowed to fool with the animal and you should never attempt treatment on your own. While the treatment appears comparatively simple, only a qualified veterinarian will know what to do in case something goes wrong or the animal shows serious side effects from the treatment. So take your dog to a vet.

In his private practice at Delta Animal Clinic in Gretna, Dr. Gonzales makes certain all infected dogs are kept in a cage from 10 to 14 days. During the first three days, an injection of Caparsolate Sodium is administered twice daily to kill the adult worms. An enzyme injection is given to dissolve the bodies of the dead worms, but there is always some damage to the lungs. The animal is kept as immobile as possible in a cage for the remainder of the period, a relatively new procedure that Dr. Gonzales credits with a dramatic increase in the recovery rates of dogs he has treated.

"Some people talk in terms of a 50 per cent recovery. Here we are saving 99 per cent of the infected dogs, and I think this is because we keep them in cages so that the animal cannot exercise. Exercise gets the blood flowing faster and there is a good chance the dead worms will block the pulmonary artery on the way to lungs and cause death."

Six weeks after the dog has been sent home, it is given a daily dose of Dizan tablets for seven days. This drug destroys the microfilariae still circulating in the dog's bloodstream. A week after the last dose of Dizan another bloodtest is run. If the animal has received the proper treatment and care, he should be completely free of both adult and larval heartworms.

Generally speaking, the heavier the heartworm infection, the greater will be the damage to the lungs during treatment. For this reason, owners of expensive hunting dogs with heavy infections of worms sometimes want to try surgical removal of the worms to lessen or eliminate such damage to the lungs. Dr. Gonzales says he used to do a good deal of this sort of surgery, but the high loss of animals caused him to advise owners against the procedure.

"It's expensive, too," says Dr. Gonzales. "It will cost you anywhere from $300 to $400 for this sort of surgery, and you have very little assurance that your dog will even survive the operation. Heart surgery is, of course, very delicate, and the likelihood of your dog being his old self again, even if he survives, is very slim."

Compared to treatment, which even in mild cases can run $75 or more, prevention is practically free: about $1.50 to $2.00 a month. All that it requires is that you give your dog a daily dose of a liquid drug, Dirocide (by Squib) or diethylcarbamazine, sold under the commercial names of Styrid-Caricide Oral Liquid (made by American Cyanamid) both obtainable from your vet. To be effective, the drug must be administered every day. Given properly, in daily doses, diethylcarbamazine is apparently 100 per cent effective, according to Dr. Gonzales.

"But you shouldn't skip a day," warns Dr. Gonzales. "I have a friend who left town for about a week and asked his wife to give his dog the drug. About a year later the dog turned up with a bad case of heartworms, and the wife admitted that she had inadvertently missed five days. It was the guy's best dog, and I thought he was going to explode. You have to get on the preventive program and stay on it for it to work. There are no exceptions to this."

Because the liquid form of the drug is 100 per cent effective, Dr. Gonzales recommends its use over Caracide tablets, which are given every two months to kill infective larvae (microfilariae). The tablet program, according to Dr. Gonzales, is only 80 per cent effective.

"Some vets still give injections twice a year to kill immature worms in the heart and call it prevention," he says, "but I don't do that anymore myself. I don't call that prevention; I call it treatment. Those worms are going to end up in the lungs, mature or immature, and scar tissue is going to form as a result. Of course, this will really slow down a hunting dog."

Dr. Gonzales' prevention program consists of three steps:

—Have a vet give your dog a thorough heartworm check at least once a year; preferably, twice yearly.

—Get your dog on the liquid prevention drug and keep him on it for the rest of his life.

—Should microfilariae show in your dog's blood, begin treatment immediately.

"I should caution dog owners that the amount of the microfilariae which show up in tests on their animals is no sure sign of how many heartworms may be in the heart," says Dr. Gonzales. "We have had dogs which show little or no microfilariae yet have heavily infested hearts. Conversely, we have had dogs with millions of microfilariae in their bloodstreams but very few worms in their hearts. The number of microfilariae in the bloodstream even fluctuates with the time of day!"

For the time being, at least, there is very little hope that anyone will discover a way to rid us entirely of heartworms, not as long as we have mosquitoes around. Apparently, more than 30 species of mosquitoes can carry the larval parasites, and encysted worms have been found in cats and rarely even in humans. Fortunately, only dogs seem to provide the internal environment in which mature heartworms can develope. Screening of the dog's pen or keeping him inside are no solution, according to Dr. Gonzales.

"The mosquito will always find some way to get to the dog, you can be sure of that. The preventive program of a daily dose of diethylcarbamazine is the only way to keep your dog free of heartworms."

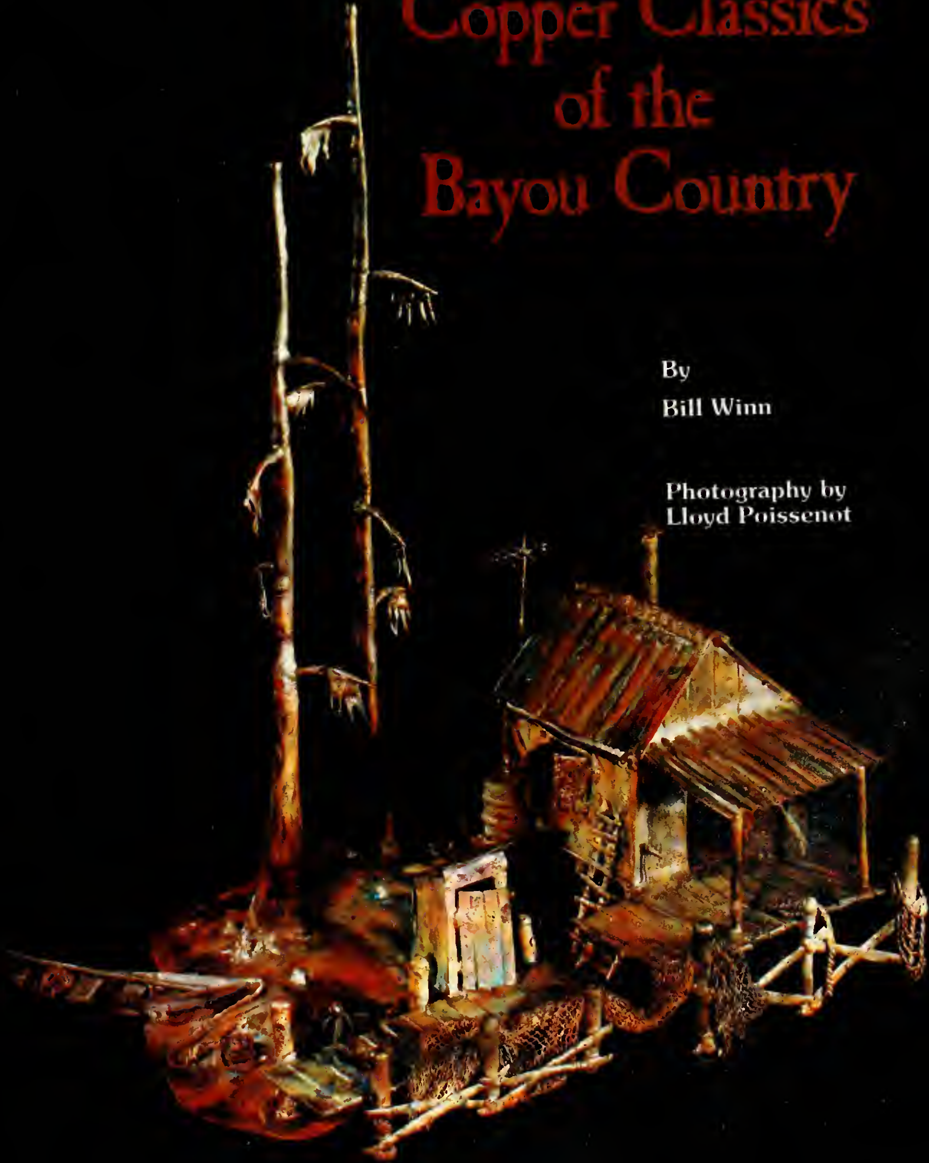
Larva
Dirofilaria immitis

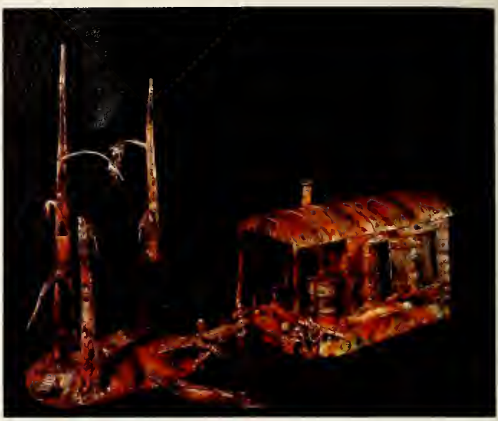
DON ALVARADO

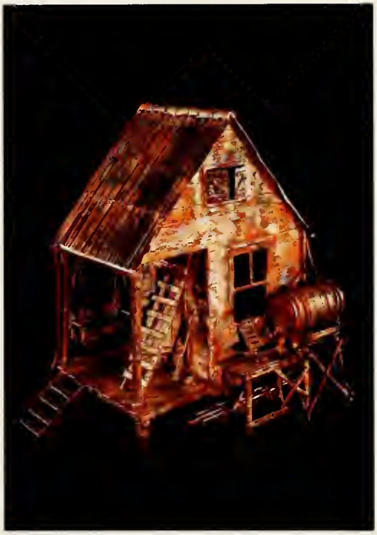
Copper Classics of the Bayou Country

By
Bill Winn

Photography by
Lloyd Poissenot







Thirty-one year old, Morocco-born Philippe Blenet, a resident of Louisiana since 1969, is better known as an expert professional deep sea diver and underwater photographer than as an artist. But artist he is, as you can see from these photographs of his highly stylized, exuberantly original versions of sights—oil wells and fish and trapping camps—as familiar to Louisianians as red beans and rice.

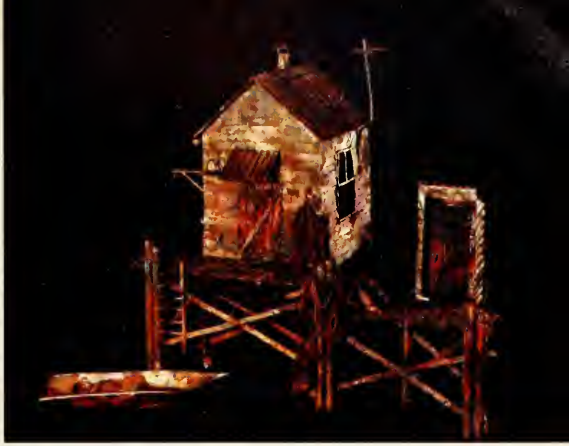
All of Philippe's work, which he does in the patio of his little French Quarter apartment in New Orleans, is done in copper, a medium he says he found natural because "all my life I have worked with my hands."

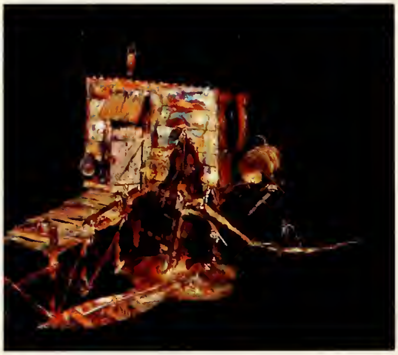
Philippe, who speaks with a marked accent and looks, acts, and talks like Frenchmen are supposed to, says each one of his creations is the product of thirty to forty hours of labor.

"But ees not labor to me," he says. "I enjoy eet, and if some other people think eet ees good, even artistik, zat ees alright with me."

Many people who know Philippe professionally in his work as a diver would be surprised at the artistic side of his nature. He is among the better known light rig divers in the state, and his underwater experience includes five years in the French Navy and commercial diving activity in the Persian Gulf, the Aegean, the North Sea, Mediterranean, off the coasts of North Africa and Ecuador, and almost five years under the oil platforms off the Louisiana coast. He has also laid pipe under the Mississippi River, a tough, dangerous assignment that gave even Philippe pause.

"I have been diving for such a long time," he says, relaxing both his hands and, for a moment, even his accent over a cup of strong coffee, "that I begin to think of some other way to make a living. But I am a *manuel* (laborer) you know, and I must work with my hands. So, I started out a few years ago with





Date________________________

LOCATION
L. C. CLASS.

A-B	Humanities	Main
C-L	Soc. Sciences	Basement
M-P	Humanities	Main
Q-V	Sciences	Second
Z	Library School	Second

DEWEY CLASS.

000-009	Humanities	Main
010-029	Library School	Second
030-089	Humanities	Main
090-099	Library School	Second
100's	Humanities	Main
200's	Humanities	Main
300's	Soc. Sciences	Basement
400's	Humanities	Main
700's	Humanities	Main
800's	Humanities	Main

Listening Rooms	Basement
Louisiana & Rare Book Rooms	Second
McIlhenny Room	Second
Middleton Room	Basement
Newspaper-Microform Rooms	Basement
Reserve Book Room	Basement

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have tables inside and the tables have coffee pots, about the size of thimbles, on them—Philippe won't say whether the pots have coffee in them). Every detail of the camp—ropes and lines, barrels, fish nets, trees, moss—is made from copper, which Philippe manages to coax into astonishingly intricate patterns (his copper ropes look just like hemp and the fish nets are so realistic it is difficult—see for yourself—to tell them from the real McCoy).

Philippe says walking through French Quarter art galleries inspired him to try his luck at some sort of creative enterprise.

"As I say, I have always done things with my hands. I built my own diving helmets; I've done plenty welding; worked with explosives. So it was quite natural for me to work in metal. It's something I enjoy very much, but, of course, I don't ever want to give up underwater cinematography."

Philippe, who has a dual American and French citizenship, says he has no plans to leave Louisiana.

"I love eet here," he says, smiling and lapsing back into his accent. "These crazy cajuns remind me of France, and ze countryside ees so beautifool. Now, if only I could sell some of my sculpture maybe I would not have to spend so much time beneath the water. Who knows," he says smiling and rising to go back to his work, "perhaps some day I will be famous artiste of the bayous!"

mammals of louisiana... and adjacent waters

The name George Lowery is automatically identified with *Louisiana Birds.*

And rightly so. His eminently successful book by that name—long the bird-watchers' bible for Louisianians—is now going into its third, revised edition.

But Lowery, who founded the Lousiana State University Museum of Natural Science, has spent more than four decades studying the habits and characteristics of the state's wildlife, and he is unquestionably the leading authority on Louisiana mammals.

Little wonder, then, that when the Louisiana Wild Life and Fisheries Commission undertook to issue a book on the subject, Professor Lowery was asked to prepare the text.

After nearly twenty years of cooperative effort by Lowery and the Commission, *The Mammals of Louisiana and Its Adjacent Waters* has now become a reality. One of the few books of its kind and the only comprehensive treatise on the subject, the volume is being published for the Commission by the Louisiana State University Press.

Handsomely illustrated, it will contain more than 300 illustrations (both color and black and white) and maps and accounts of seventy-one species of mammals known to occur in the state, including man himself, as well as other species of uncertain or unconfirmed natural occurrence, domesticated animals, and mammals known only as fossils.

For Ted O'Neil, chief of the Commission's Fur Division, who guided the project from its inception to its completion, publication of the book will climax a lifetime of absorption with the fur animals of Louisiana and their ecology.

"Ted is responsible," says Lowery. "It would never have been done had it not been for him."

It was O'Neil who first approached Lowery in the mid-1950s with the idea of revising and updating the long out-of-print book *The Fur Animals of Louisiana* by Stanley Clisby Arthur, which the Commission had issued in 1928. Although the average American associates fur trapping with some Canadian or Alaskan wilderness, Louisiana—the land of pirogues, Spanish moss, mudboats, and Snowy Egrets—is actually today the leading fur-producing area on the North American continent and has been for as long as official records have been kept.

But instead of simply revising Arthur's book, Lowery set about writing a book that would cover not only the fur-producing animals but every single mammal known to occur in the state—the opossums, shrews, armadillos, rabbits, squirrels, bears, raccoons, mustelids, manatees, deer, and bovids, as well as the whales and dolphins of its coastal waters. "I felt," says Lowery, "that there were just as many people interested in learning about the bats squeaking in their attics or the moles digging up their lawns as were interested in fur animals."

Ted O'Neil, left, chief of the Commission's Fur Division, was instrumental in getting LSU professor George Lowery to write THE MAMMALS OF LOUISIANA.

The Commission lent its support to the project, and Lowery intensified efforts to collect specimens and map the areas of occurrence of various mammals. Graduate students were enlisted to help in trapping additional specimens, and in the summer of 1972 H. Douglas Pratt, a talented graduate student in zoology at LSU, was commissioned to do the illustrations for the book.

The Mammals of Louisiana features color portraits ot all Louisiana land mammals, color and black and white illustrations of all marine mammals of the northern Gulf of Mexico, photographs of numerous species and their habitats, drawings of the skulls of all species, numerous sketches of animals tracks, and maps showing the range in the state and the points of record, as well as the continental distribution, of each species.

The result is a large, beautiful book (there's hardly a page without an illustration) that will fascinate anyone with an interest in the out-of-doors. Of course, there's plenty of technical information that will be valuable for students of mammalogy and wildlife management, as well as for professional mammalogists; but, says Lowery, "I've tried to give information that will interest the general public."

BACKYARD FISHING BONANZA

In answer to numerous requests, the CONSERVATIONIST offers some advice on constructing a fish pond. Most of the following information is condensed from a pamphlet by LWLFC Assistant Chief, Oysters, Water Bottoms & Seafood, Max W. Summers, MANAGING LOUISIANA FARM PONDS, currently out of print. A supplement to this article — THE LIFE CYCLE IN A FISH POND — will appear in the next issue of the CONSERVATIONIST.

The success or failure of any pond depends largely upon its location. Careful thought should be given to the selection of the proper site because this choice determines the life, productivity, cost, and ease of construction, as well as the general usefulness of the pond.

In selecting a location for your pond, perhaps the most important prerequisite is to make certain that the soil in the area will hold water. The best pond sites are located in small depressions, valleys, or in wet, boggy areas. This type of land is usually unsuited for cultivated crops or other farm uses. Select a place where the levee or dam can be constructed at the lowest possible cost. The drainage area must be able to supply the pond with enough water so that a reasonably stable water level will be maintained at all times. *Waters or streams flowing through the pond are not desirable.* Such flows require a more expensive spillway or control structure to handle the excess water. Also, this flow of water makes fertilization impractical: each time fertilizer is applied, the moving water will flush it over the spillway. For these reasons, a pond with a stable water level is generally a much better fish pond—and we assume that is what you are after—than one with a constant flow of water.

Make certain the area conforms to the following checklist before the final site determination is made: (1) a relatively uniform water supply; (2) a good basin in which to impound water; (3) soil of an impervious nature so as to prevent seepage loss of water through the pond basin; (4) a relatively small watershed, to avoid large volumes of runoff; (5) a watershed with good vegetative cover, to reduce siltation of the pond; (6) topography that permits easy, inexpensive construction, and maintenance of sufficient water depth at all times.

SIZE AND DEPTH

The use to which you wish to put your pond should determine its size. For fishing, a pond of from one to three acres is usually sufficient; if the pond is to be used to water livestock or for irrigation, it should be from three to five acres in size, and an auxiliary tank or small pond should be built below the main pond for agricultural use.

The depth of the pond should be sufficient to keep a minimum of four feet of water over most of the pond during periods of prolonged drought. To insure an adequate water supply under these conditions a maximum depth of from six to eight feet should be established. *Really deep water is not necessary to insure optimum fish production.* Studies indicate that ponds which vary from two to six feet in depth produce higher annual crops of fish than do ponds which are deeper. Very shallow water, however, is undesirable, and steps should be taken to prevent any part of the pond from being shallower than 24 inches. Shallow water encourages troublesome aquatic weeds. These weeds cause an overabundance of small fish by protecting them from predatory bass. Ponds which are free from weeds are easier to manage and produce more fish.

WATERSHED AND DRAINAGE

A good fish pond must have a relatively small watershed and one that is protected by vegetation to prevent erosion and silting from runoff in bare, exposed areas. Generally speaking, the ratio of area drained to the size of the pond should be from five to ten acres of pasture or cover cropland and from ten to twenty acres of timberland per surface acre of water impounded. When you calculate your watershed area, include the acreage of the pond.

WATER SUPPLY

The water supply must be of sufficient quantity to keep the pond filled. It should

be adequate to replenish all water lost through initial seepage and evaporation. An excess of water, to repeat, is undesirable. An ideal pond has a water supply that keeps the water level from fluctuating drastically and yet does not overflow or force water out of the pond.

Small springs and artesian wells are good sources of water for ponds if the flow of water is not too great, but it may be necessary to build a diversion ditch to carry natural runoff away from the pond. Also, spring and artesian water, or any underground source of water for that matter, may be saturated with carbon dioxide and iron. Very little oxygen is present in this water, and oxygen is essential to the existence of fish life. In order to remove carbon dioxide from these sources, water should be baffled or made to trickle down over rocks or slopes.

SOIL REQUIREMENTS

Remember, before you start construction of your pond, make certain the soil will hold water. The soil must contain a sufficient amount of clay to build the levee and to provide an impermeable basin which will be free from excessive seepage. A good rule of thumb: pick up a handful of most soil and compact it into a ball. If the ball remains intact and does not crumble after considerable handling, there is probably enough clay in the soil to provide a watertight seal in the basin proper and between the basin and the levee.

CONSTRUCTING THE POND

Good ponds are not created by accident; they are carefully planned. Before you start to build a pond, you can save yourself time and unnecessary expense by contacting your local Soil Conservation Office or Agricultural Extension Agent. They are familiar with the engineering problems associated with your particular area and can provide valuable help.

A fish pond should not be built too far in advance of the time fish are available for stocking. You should plan to complete the ground. This will remove all material that the time of the year that will not be affected by frequent rains so that the heavy equipment necessary to build a pond will be able to perform efficiently. A pond built in late summer or early fall will have ample time to fill with water prior to the time of stocking.

CLEARING THE SITE

After the most suitable location has been selected, the area should be cleared of all trees, shrubs, branches, leaves, and other debris. With the aid of a level or surveying instrument, determine the exact area to be flooded. When this is done, put out some guide markers around the area to help you clear the correct amount of land.

In addition to clearing the pond basin, a 15 or 20 foot wide strip back from the water line should be well cleared. Trees, stumps, and heavy vegetation are not desired around the edge of a pond. Also, make sure there are no trees, stumps, or roots where the levee is to be located: if these are pushed up with the levee there is a good chance leaks will occur, especially when this litter begins to decay. In order to prevent any chance of leaks, scrape the levee site entirely clear of loose soil, organic matter, or any other loose materials.

BUILDING THE LEVEE

The levee is the backbone of the pond, and wherever possible it should be constructed entirely of an impervious clay. If there is not a sufficient amount of clay available for the entire levee, at least the core of the levee should be made of clay, which will provide a firm bond to the pond basin and to the side walls of the levee itself.

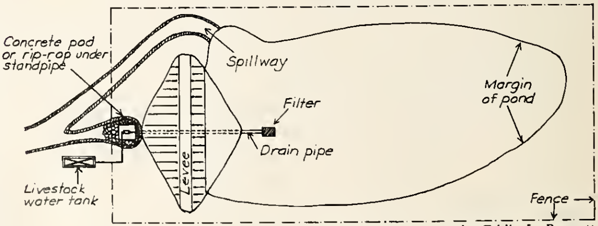
After clearing the area thoroughly, the site where the levee is to be built should be dressed down to a depth of at least one foot below the surface of the ground. This will remove all material that would prevent a good seal between the pond basin and the base of the levee.

The levee should then be built in the following manner. First, a core trench should be dug and filled with a sticky clay the entire length of the levee. The central trench should be at least 10 feet wide and extend three or more feet into the subsoil. Next, dig a ditch for the drain pipe. Every pond should have a drain outlet with a gate or shear valve so the water may be lowered or completely drained from the pond as this may be required in future management practices. This ditch should be dug at right angles to the levee and should be from one to two feet wide. It should be constructed to the controlling elevation of the pond basin so that all the water impounded by the levee may be drained off, should this ever be necessary. The pipe should be made of some nondestructible material such as asbestos-cement, galvanized steel, or cast iron. The diameter of the pipe should be adapted to the pond size. A four inch pipe will be satisfactory for ponds of from one to three acres; a six inch pipe for ponds from four to eight acres; an eight inch pipe for ponds from nine to twelve acres; and ponds in excess of twelve acres require a twelve inch drain in order to remove the water rapidly.

The drain pipe should be installed after the core trench is filled with clay up to the intended position of the pipe. This will allow heavy equipment to completely compact the fill below the pipe. A pipe of sufficient length to provide at least two feet on either side of the finished levee is necessary. This will provide an ample amount of room to install the filter box or barrel and the valve which will control water discharge. The pipe should be laid and all joints sealed and braced so that there will be no danger of leaks occurring when the pipe is filled. Once the pipe is in place, concrete collars set 15 to 18 inches in the ground should be installed at 12 to 15 foot intervals to prevent leaks and add strength to the span of pipe; the remainder of the ditch should then be filled and packed tight with a heavy clay to insure against seepage and loss of water through the levee. The clay fill around the drain pipe should be at least 12 inches thick and be applied in several thin layers.

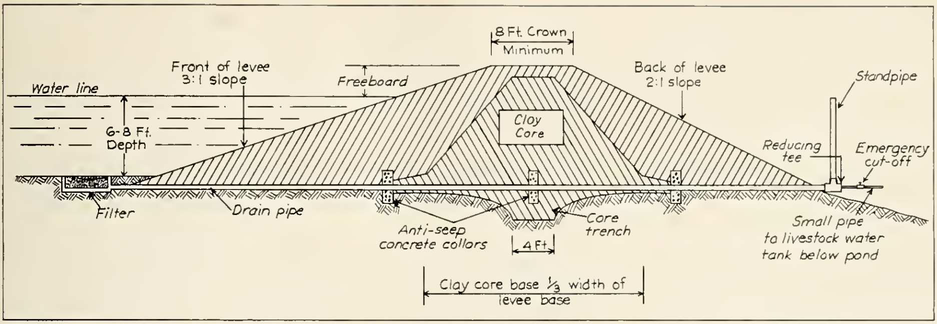
The core or heart of the levee is the next step. After the drainage pipe and core trench are covered the core of the levee should be established. This center wall should be made of impervious clay and should be constructed no less than four feet wide at the base. It should be continued the full height of the levee.

The height of the levee will depend upon the location of the pond and the amount of water to be impounded. The outside levee walls are built up against



Drawing by Eddie L. Bennett

Sample Layout of a Farm Pond



Drawing by Eddie L. Bennett

Cross section of the levee

the core of the levee. Earth should be scooped around the center mold and be shaped so as to give gently sloping sides. The pond side should slope three feet for every one foot rise in elevation; the land side should maintain a two foot slope for every one foot rise.

The top of the levee should be at least eight feet in width. This will insure a base of sufficient width, if the sides are sloped the correct amount.

When constructing the levee, the core and side walls should be built six to eight inches at a time, and the soil should be thoroughly packed as the work progresses.

Small ponds of from one to three acres should have at least two feet of freeboard—the vertical distance from the water line to the top or crown of the levee—and in the larger ponds a freeboard of three feet is generally sufficient to allow for wave action.

THE DRAIN OR WATER OUTLET

Complete control of the water volume and level is essential in managing a small pond for maximum fish production. This control also provides a ready source of water for multi-purposes such as livestock, irrigation, and water for wildlife. Installation of the drain pipe will allow water to flow from the pond while it is under construction and, when the pond is completed, it will also function as a safety factor during extremely wet years.

A gate or shear valve should be installed in the drain outlet on the back or land side of the levee. This will control water in the pond simply and effectively. Should this prove too costly, an elbow or tee joint with a stand pipe the same height of the desired water level can be substituted; when it becomes necessary to remove water from the pond the upright length of pipe can be lowered to start drainage.

The drain pipe extending into the pond should be protected from silting or being stopped up by placing it in a sump filled with gravel. A screen or some other type of filter trap placed over the pond end of the discharge pipe will also keep it free from muck, trash, and other material which might clog the pipe and foul the drainage outlet.

SPILLWAY SIZE AND DESIGN

The size and design of the spillway is extremely important because it is the safety valve protecting the levee. The spillway must be wide and flat enough to allow passage of overflow waters out of the pond. This flow should be slow and shallow, and should not exceed three inches in depth. Fast, deep runoff will cause erosion, damage to the levee, and could cause the loss of some fish. A spillway must be large and wide enough to carry away all excess water even in time of flood or heavy rainfall.

Spillway size is determined by the actual area or watershed the pond drains. The spillway width with a very minimum of watershed should be at least 10 per cent of the length of the levee. For ponds with watersheds greater than 10 acres increase the bottom width of the spillway one foot for every additional two acres of watershed.

The floor of the spillway should be constructed at least three feet below the crown of the levee, giving ample freeboard protection for the levee.

When constructing the spillway, locate it on solid, undisturbed ground away from the levee. Usually there is a natural spillway area available. If not, one can be built at one end of the levee. If it is impossible to build one large spillway, it may be necessary to locate smaller ones at each end of the levee. *Extreme care should be exercised to leave the floor of the spillway level.* Even a slight depression may be enough to start severe erosion. As soon as the spillway or spillways are complete, they should be mulched, seeded, or sodded in order to provide a protective cover and prevent erosion.

CONTROLLING EROSION AND SEEPAGE

The life and future success of a fish pond depends largely upon its watershed and the permanent vegetative cover which protects this area from erosion. The growth of sod-farming vegetation upon the watershed guards against erosion and prevents the pond from filling with silt. When silt enters the pond in large amounts, the pond becomes muddy. Muddy water is unsuitable for fish and livestock use.

To combat erosion and prevent silting, watershed protection or conservation should be practiced. Your local Soil Conservation Service can give you valuable assistance with erosion problems.

The pond basin and levee should be given protection upon completion of all the earth work. All exposed areas around the pond—levee, spillway, the pond basin itself—should be fertilized, mulched, and seeded to a fast growing bunch or sod-forming grass. The complete protection of these areas is essential to assure a successful pond.

MANAGING THE POND FOR FISH PRODUCTION

Any pond can be made to produce fish, and with proper management you can get your pond to produce more and larger fish. The weight of fish a pond can support is dependent upon the amount of food available to the fish. The amount of food in a pond is dependent on the natural fertility of the watershed. Ponds in the pine regions of Louisiana may support only 20 to 30 pounds of fish per acre without fertilization, while ponds in the delta area or fertile river valleys may produce from 100 to 200 pounds of fish per acre.

Fish grow very rapidly if there is ample food. Conversely, they grow very slowly or become stunted if there is too little food. Too many fish in a pond reduces the food supply per fish and causes small, undersized fish and poor production.

A pond normally reaches its carrying capacity—the maximum number of pounds of fish it can support on the available food supply—within one year after stocking. This takes into consideration the annual reproduction of the fish originally stocked. In order to increase the size of the fish in the pond after a successful spawning season, the food supply must be increased or the number of fish in the pond must be reduced. *The key to fishing success in ponds is the production of food and the management of fish populations so that a definite balance is established and maintained.* It is vitally important, if you are planning to build a pond, to become as familiar as possible with the basic elements of pond management, particularly with the function of the food chain.

PROPER FERTILIZATION METHODS

The size of fish crop produced by your pond is directly associated with the fertility level of the pond water. If the area drained by the pond has a low fertility level, it will be necessary to follow a fertilization program in order to obtain increased yields of fish. By fertilizing the pond at regular intervals the total weight of the fish a pond will support can be increased two or three times.

Use of a commercial fertilizer will produce the following beneficial results: (1) increase the production of fish food; (2) stimulate growth and increase annual yields of fish; (3) produce better fishing success; (4) control or eliminate submerged aquatic weeds.

Fertilizer increases a pond's productivity by releasing nutrient elements of nitrogen (N), phosphorus or phosphoric acid (P), and Potassium (K), into the water. These elements are water soluble and dissolve or go into solution after being added to the pond. These nutrients provide the necessary fertility level to produce vast numbers of microscopic plants and animals, called plankton. Plankton provides food for water fleas, insect larvae, and other aquatic organisms which are eaten by small fish, such as bluegill (see Food Chain in next issue of the *Conservationist).* The bluegill or forage fish are in turn fed upon by predaceous fish, such as bass. This food chain is of extreme importance when managing a pond for maximum fish production. Fish need food and lots of it if they are to grow to catchable size.

Plankton simulated by the application of fertilizer grow and reproduce rapidly and, depending on the kind, tend to color the pond water either green or brown. The color, produced by great numbers of these minute organisms, shades out sunlight. Since submerged aquatic plants, most of which are undesirable in a fish pond, need sunlight to live, fertilizing has a controlling effect upon their growth.

Fertilization should begin during the first warm weather of early spring, and be continued throughout the summer and fall. In Louisiana, winter fertilization may be advisable if submerged aquatic weeds are a problem. Applications of fertilizer should be made at weekly or ten-day intervals, and be continued until the water is colored by the growing plankton. This color should be dense enough to obscure a bright object when immersed to elbow depth.

There are various mixtures of commercial fertilizer readily available and suitable for pond use. Most mixtures have been tested in our fish hatcheries, and the best results were obtained with an 8-8-8 analysis. This latter figure stands for percent, respectively, of nitrogen, phosphorus, and potassium in 100 pounds of fertilizer. This concentration of elements makes this fertilizer equal to about one ton of barnyard manure. Organic fertilizers, by the way—barnyard manure, dried vegetation, cottonseed meal—should not be used because the fertility level of these materials varies, and organic matter is likely to produce an undesirable scum and contaminate the pond by providing places for parasites and disease organisms to live.

For each application of fertilizer use 100 pounds of 8-8-8 per surface acre of water. Individual ponds will require different amounts of fertilizer. Some ponds may need only six or seven applications yearly, while others will require as many as twelve or fifteen. On the average, ponds of medium fertility will require eight to ten applications per year. Let the color of the water be your guide when determining how often to fertilize. You can apply fertilizer to a pond by broadcasting it by hand around the perimeter. If the pond is several acres in size, you can use a boat. Pour the fertilizer over the side as you paddle around the shallow water. Avoid applying the fertilizer in water deeper than five feet because deeper water is not agitated by wave action and the fertilizer will not mix as rapidly. Try to cover all the shallow water with each application.

CORRECT STOCKING PROCEDURE

The primary objective of any fish pond is to continued production of usable fish. In order to achieve this, the pond must be stocked with the correct kinds and numbers of fish. Numerous experiments have shown that the most dependable species to use for pond stocking are large-mouth bass and bluegill sunfish in combination.

Bass are predaceous fish and are necessary to keep bluegill populations in check. Bluegill, or bream as they are often called, are mainly insect feeders and do not help control fish populations. Bluegills have a long spawning season, usually from April through September in Louisiana. They reproduce in great numbers, and if there is no control placed upon them, they soon will be so abundant their food supply will not support further growth and an overcrowded, stunted fish population will result. Bass must be stocked to prevent this happening.

When it comes time to actually stock the pond, you should know its size to the nearest one-tenth of an acre. This is important for two reasons: in order to start the pond out properly, the correct number of fish should be stocked, as under or over-stocking will result in an unbalanced fish population; and you need to know the surface area of your pond so you can apply the correct amount of fertilizer.

The correct stocking procedure is to stock 10 bluegill for every 1 bass. The number of fish stocked depends upon the fertility of the individual pond. In fertilized ponds, the prescribed stocking rate is 1000 bluegill and 100 bass per surface acre of water. Unfertilized ponds of average fertility should be stocked with 500 bluegill and 50 bass per acre.

Stock only hatchery-reared fish. These fish will be the right size and they will be healthy stock free from disease. Also, hatchery fish will be available at the desired time of year and will be sorted for delivery so there will be no danger of stocking trash fish. Fish are stocked free of charge as a public service by the Louisiand Wild Life and Fisheries Commission. However, the areas to be stocked must be approved by a qualified state fisheries biologist.

Bluegill are harvested from the hatcheries in the fall and are available for stocking in December and January as fingerlings. Bass are removed from the hatcheries in the spring and are available for stocking in May and June. *It is essential to stock the bass after the bluegill have been planted, but as far in advance of the bluegill spawning season as possible.* This will enable the bluegills to reach sufficient size by the time the bass are introduced, so there will be no danger of the bass eating a large number of the originally stocked bluegills, thereby creating an overabundance of bass and an unbalanced pond. The first hatch of bluegills assures the bass of an ample supply of food and the presence of the bass will control the bluegill population and prevent overcrowding.

To obtain fish for stocking purposes, send a card or letter to the Louisiana Wild Life and Fisheries Commission, Fish and Game Division, 400 Royal Street, New Orleans, Louisiana 70130 or to your nearest LWLFC district office. You will be sent an application for fish. After you have completed this form, answering all questions as accurately as possible, return it to the above address, and your name will be placed on the list of areas to be checked. After your pond has been inspected and your application approved, you will be placed on the list to receive fish. You will be notified prior to their delivery date.

BUSSEY LAKE

[Morehouse Parish]

JANICE S. HUGHES
Fisheries Biologist

Bussey Lake is a 2,200 acre impoundment in Northeast Louisiana that was constructed in 1959 by International Paper Company. The purposes of the lake were to provide a water supply for two paper mills located in Bastrop and to provide a recreational area. International Paper Company established several rules on the lake which do not allow water skiing, swimming, commercial fishing and use of outboard motors in excess of 10 horsepower.

Louisiana Wild Life and Fisheries Commission stocked this lake in 1959 with largemouth bass, black crappie, bluegill and channel catfish. On April 30, 1960, the lake was opened for fishing and soon became known as the "hottest" fishing spot in the South. Stringers loaded with bass, "bream" and crappie were caught from the lake by fishermen from all over Louisiana and neighboring states. Fishing remained excellent for 3-4 years and good for several years to follow. Even though not as many fishermen are attracted to Bussey Lake now as before, the fishing is still better than on most Louisiana lakes.

Only one boat dock is located on the lake, but six additional access points are available along the east side of the lake. Boats can be launched and tied up at these locations.

International Paper Company has worked closely with the Louisiana Wild Life and Fisheries Commission and has initiated all lake management recommendations. These have included periodic water level fluctuations for both weed control and fish population management and removal of commercial and trash fish when necessary.

Many bass fishermen have expected the state record to be broken in this lake. Several 10 pounders have been caught and our studies show that several more are still in the lake. Fishermen who know the lake can show you exactly where to cast your bait to get a strike. These fishermen are successful all year long. Others have to wait until the bass are spawning on the "back side" (west side) before they can catch their limit. You may not be able to catch many bass, but there are some big ones out there.

"Bream" fishing is usually good during the spring and summer but most of the bluegill are small. After the third year of fishing the bluegill population "exploded" and the lake is now overcrowded with this species. When the lake is drawn down many bluegill are eaten by the bass and crappie, but they always come back. Redear (chinquipin) have become abundant and are much larger than the bluegill. If you want to catch many "bream", Bussey is a good place to go. Children will especially enjoy "bream" fishing.

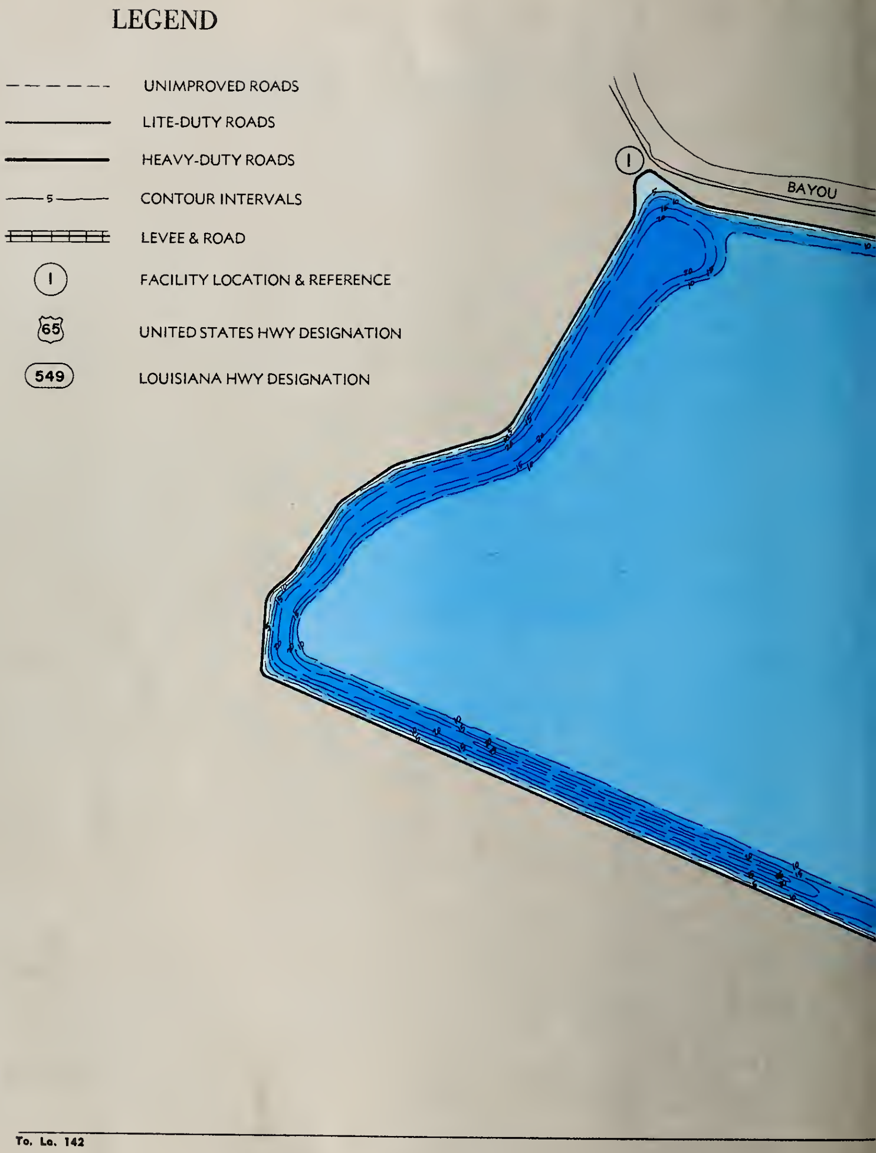
Crappie fishing is cyclic, but it is usually quite good. There was a large crappie sprawn in 1969 and these fish are catchable size now. Many fishermen fish for crappie and other sport fish at night using lanterns to attract fish. This type of fishing has been very popular for several years.

Channel catfish and flathead catfish (opelousas cat) have increased within the last two years. Several large flatheads have been taken on trot lines. I would recommend that you try your luck for these fish if you like catfish to eat.

You can have many pleasure filled hours seeking your favorite species of fish in Bussey Lake. The next time you are in Northeast Louisiana, stop by Bussey Lake and fish for a while.

BUSSEY LAKE FACILITIES DATA

LANDING	Boat Launching	Launching Fee	Rental Boats	Boat Storage	Rental Motors	Fuel	Oil	Bait	Guide Service	Refreshments	Rest Rooms	Playgrounds	Ice	Drinking Water	Water	Electricity	Shelters	Tables	Grills	Firewood	Trash Cans	Camping Area	Trailer Space	Cabins
1. Bussey Lake Boat Dock	X		X		X			X		X		X	X			X		X		X	X	X	X	X


LEGEND
UNIMPROVED ROADS
LITE-DUTY ROADS
HEAVY-DUTY ROADS
5
CONTOUR INTERVALS
LEVEE & ROAD
1
FACILITY LOCATION & REFERENCE
65
UNITED STATES HWY DESIGNATION
549
LOUISIANA HWY DESIGNATION
1
BAYOU
5
10
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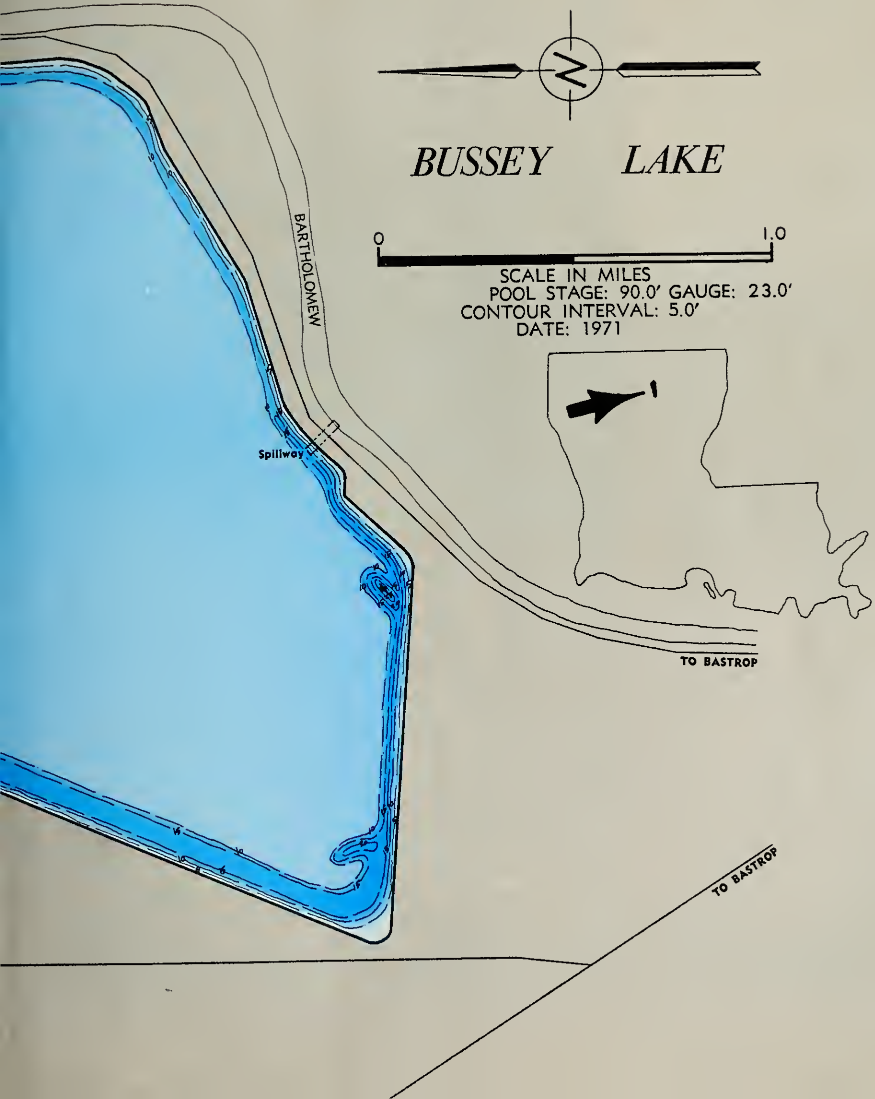
BUSSEY LAKE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1.0
SCALE IN MILES
POOL STAGE: 90.0′ GAUGE: 23.0′
CONTOUR INTERVAL: 5.0′
DATE: 1971
BARTHOLOMEW
Spillway
TO BASTROP
TO BASTROP

Recreation

By Dewey Wills
Outdoor Recreation Coordinator
Louisiana Wild Life and
Fisheries Commission

During recent months almost every Louisiana citizen was made aware that our country is facing a serious energy problem. Our attention was constantly directed to the "energy crisis" by the news media, by many agencies of various governmental bodies, and by the thinness of our wallets when we left the gas station. Although it has received much less publicity, those of us with some area of responsibility in the field of outdoor recreation have come to realize that we too have problems that are steadily building to monumental proportions.

The factors which brought about the energy crisis are extremely complex, but it is easier to explain why we are faced with a recreational crisis. First, we have seen great changes in land use in our state—since the end of World War II a vast amount of Louisiana's land that formerly furnished recreational opportunities has been converted to agriculture, used for industrial expansion, for residential development, highways, and other needs of our fast growing state. Second, our population has increased constantly. Third, our standard of living is higher than ever before—people have more leisure time and they travel more. And fourth, our population as a whole is more mobile.

More people are seeking activities in the out-of-doors than ever before, and the Louisiana Wild Life and Fisheries Commission recognizes that it has a great responsibility in furnishing recreational opportunities. Let's look at the active role presently played by the Commission in providing outdoor recreation to many thousands of outdoor enthusiasts in Louisiana.

WILDLIFE MANAGEMENT AREA PROGRAM

The Commission's largest contribution to recreation is through its Wildlife Management Area Program. The Game Division today manages a total of 33 wildlife management areas. The acreage involved consists of 641,765 leased acres, in addition to the 268,339 acres owned by the Commission. The Wildlife Management Areas furnish over 50,000 deer hunting opportunities and provide a harvest of approximately 2,500 deer annually. In addition to deer, waterfowl and small game is hunted by thousands of sportsmen each year. The areas also furnish many enjoyable opportunities to fishermen, campers, nature lovers, birdwatchers, and others seeking outdoor recreation.

For those who want to combine a hunting or fishing trip with camping, many of our Wildlife Management Areas have camp grounds with an organized layout of roads, parking spaces and campsites, while others provide only minimum facilities. The camping areas provide many man days of recreation to family groups and to hunters and fishermen using them for overnight stays.

The Commission's Wildlife Management Area Program presently provides more than 500,000 outdoor endeavors annually for hunting, fishing, camping, boating, birdwatching, and many other outdoor recreation activities.

BIG GAME PROGRAM

The Commission's deer stocking program through the years has resulted in huntable herds over most of Louisiana and is providing more than one and a half million man days of big game hunting recreation. Approximately 60,000 deer are killed each season in the state. In addition to this, countless thousands of non-hunters have been privileged to observe the elusive whitetail in its native habitat.

The present turkey stocking program has begun to pay dividends and promises a great deal of additional recreation for hunters and naturalists.

SQUEEZE

Lloyd Poissenot

FISHERIES PROGRAM

The Fisheries Division plays an important role in outdoor recreation by applying management practices, acquired through research, to our lakes, ponds, and streams to maintain or increase the fishing success and subsequent enjoyment of these areas by the general public.

Laboratory services and technical assistance are furnished to individuals, political subdivisions, and lake commissions on chemicals, herbicides, and management practices aimed at promoting successful fishing in lakes, ponds and streams.

Farm ponds and new lakes stocked by the Fisheries Division provide recreational enjoyment for many thousands of residents each year. Intensive research on the proper development and sound management of water bodies has resulted in furnishing many man hours of healthy recreation for outdoor sportsmen throughout the state.

Investigation of new species of fishes for possible introduction into state waters has resulted in the striped bass program. The ultimate aim of this program has been the establishment of reproducing populations of the striper in both fresh water impoundments and along our Gulf Coast. Stocking of these fingerlings was begun in 1965 with fish from South Carolina and later from Chesapeake Bay in Maryland. The striper is presently providing additional recreation for the fishermen in the Toledo Bend Reservoir.

Another program of this Division is the crawfish project which consists of research on improved crawfish farming. This research is yielding valuable information on managing public crawfishing areas. This has resulted in a large resource which means more opportunity for crawfish sportsmen.

ENVIRONMENTAL PROGRAM

Personnel of the Environmental Section of the Commission work with planning, construction and sponsoring agencies in public land and water management projects. They attempt to lessen or eliminate environmental damages where possible or to seek appropriate mitigating measures in other cases. They assist in administration of the state's Natural and Scenic Streams System which provides protection for portions or all of thirty-five of the state's streams. These activities are a means of assuring this and future generations of a viable natural environment that can continue to produce outdoor recreation of high quality.

BOAT RAMPS

Increasing the number of fish in a lake, having larger fish available and having a fish population in balance, all will be to no avail if fishermen cannot get to the body of water to fish. Realizing this the Commission has constructed sixty boat launching ramps on various bodies of water throughout the state. It is the Commission's long range goal to have adequate access to all public waters.

AQUATIC PLANT CONTROL

The Aquatic Plant Research and Control Section plays a necessary role in outdoor recreation by combating the "waterweeds" that are endangering our use of outdoor water resources. The section is continuously working to keep our waterways free of nuisance vegetation whereby swimmers, fishermen, boaters, and water skiiers can enjoy these water-oriented recreational activities.

WATER BOTTOM and SEAFOOD DIVISION

The Water Bottoms and Seafood Division's activities are varied and extensive. Information gained through systematic research on shrimp, fin fishes, and shell fishes, when combined with previous knowledge, provides a basis for proper management and enhancement of these resources. This research has provided useful information in managing these renewable resources, adding nearly 100 million dollars to the state's economy as well as furnishing many varied opportunities for outdoor recreation. A cooperative education program, held at the division's marine laboratory, consists of lectures, tours, and field trips, and is conducted by staff personnel and attended by university, college, high school, and civic groups. This has led to a greater knowledge and appreciation of our marine resources, and it has afforded many hours of enjoyment and educational benefit to our outdoor enthusiasts.

WATER POLLUTION CONTROL

The Water Pollution Control Division's continued surveillance of our many water bodies, and its pollution abatement program helps in conserving the quality of our state's water resources. The division works closely with the Federal Government in an effort to keep our water supply clean and safe for the use of the many thousands of fishermen, swimmers, water skiiers, boaters, and others who enjoy water related recreation.

ENFORCEMENT DIVISION

The Enforcement Division is one of the most important divisions of the Louisiana Wild Life and Fisheries Commission. In addition to protecting our wildlife resources for the enjoyment of all, enforcement agents make every effort to help sportsmen enjoy hunting, fishing, and boating. Personnel of this division often escort various boat clubs on excursions on our many waterways within the state. They also assist in fishing rodeos, as well as lending a hand in a number of field trials each year. Another facet of an agent's duties is that of selling the wildlife story to different youth groups and sportsmen's leagues, plus teaching hunting and boating safety—all efforts aimed at helping the general public enjoy the great out-of-doors.

During an average schoolyear, more than 3000 wildlife education programs are presented to elementary and high school students in Louisiana.

The Commission's Refuge Division helps make waterfowl hunting a favorite outdoor activity for hundreds of state residents.

Fishing is one of the most popular forms of recreational activity for Louisianians.

REFUGE DIVISION

The activities of the Refuge Division are primarily directed toward further improvement and development of seven coastal marsh areas which total approximately 250,000 acres. Information gained through research and development work is made available to private landowners who have gained many additional man days of recreation through better management of the land. Another function of this division is to provide refuge areas for large portions of the hundreds of thousands of waterfowl that winter in Louisiana. This assures an adequate supply of breeding birds returning to nesting areas in the North.

Sport fishing, which is allowed on the refuges during certain times of the year, provides another outdoor recreation activity for the general public.

The Commission's turkey stocking program has already begun to pay dividends.

Lloyd Poissenot

More leisure time and a higher standard of living are two causes of Louisiana's current recreation squeeze.

Many thousands of people view waterfowl in the display pens on the Rockefeller Refuge each year. In addition many lectures, tours and field trips are conducted annually by personnel of this division.

INFORMATION and EDUCATION

The general acceptance of any program by the bill-paying, resource-using public must ultimately come from a general understanding of the goals, functions and accomplishments of the resource agency. Without the cooperation that results from this understanding and acceptance, even the best programs are doomed to failure. The Information and the Education Sections play a most important role in keeping abreast of all the Commission's activities and programs and, in turn, transmitting this information to the public.

The film library alone fills over 5,000 requests annually for publications, relative to wildlife and recreation. From a library of 250 films, loans of over 2,000 are made each year to schools, groups, garden clubs, sportsmen's leagues, scout groups, civic and other social clubs interested in outdoor recreation.

The Louisiana Wildlife Museum in New Orleans attracts more than 100,000 visitors each year. The museum stimulates interest in our wildlife resources and instills a greater appreciation for them.

The award winning "Louisiana Conservationist", the Commission's official publication with a circulation of more than 140,000 is another means used by the Information Section to inform the public of our wildlife resources.

The Education Section has an important role in outdoor recreation in that it is charged with the responsibility of teaching the youth . . . our future leaders . . . the values and benefits of our abundant wildlife resources. During a schoolyear, over 250 programs per month are presented to elementary and high school students. During the summer assistance is given to boy scouts, 4-H and other youth groups at summer camp. Instructors assist in teachers' workshops giving technical help in conservation education as well as in setting up nature trails to be used as a teaching aid.

This section also conducts a Hunter Safety and Boating Safety Program. Tremendous population increases have resulted in more hunters, fishermen, and outdoor enthusiasts, and, consequently, more possibilities for hunting and boating accidents. The Education Section tries to teach our citizens how to enjoy the great outdoors in a safe manner.

FUR DIVISION

The Fur Division promotes an industry that is participated in by five to ten thousand trappers as well as others. In Louisiana, trapping could be considered, partially, a recreational activity. Many adult outdoor enthusiasts got their first taste of the outdoors as part time schoolboy trappers participating in their own small way in the annual harvest of this multi-million dollar resource.

The Louisiana Wild Life and Fisheries Commission is actively engaged in the state's largest recreation program and will continue its efforts to make our state truly a sportsman's paradise.

The White Amur—is he an ecological disaster or the "Great White Shmoo"? Wild Life and Fisheries biologists think he could be either.

The White Amur, or the "Grass Carp" as he is sometimes called, is a controversial exotic fish under consideration for release in the United States as a biological control agent for aquatic weeds. The native habitat for this member of the minnow family is the Amur River in Manchuria and Siberia. Until he is ten inches long, the White Amur looks like a golden shiner. After ten inches or so he looks like a chub sucker, and finally develops into a long slender fish with a single fin on top and grinding teeth in his throat. A large adult of 60-100 pounds still resembles an overgrown minnow.

But why the interest in a giant minnow half-way around the world from us? Biologists have discovered that the White Amur is almost exclusively a vegetarian, with his diet consisting primarily of plants. He has a short gut which makes it necessary for him to consume large quantities of food for nourishment, eating one and a half to three times his body weight daily. The significance of this may not be obvious to many residents of Louisiana, but to those who are familiar with the state's aquatic weed problem, it means the possible control of unwelcome aquatic plants (moss) in farm ponds, fish farming ponds, lakes, reservoirs and other fresh water areas. To boaters it could mean the end of grinding slow-downs and stops in vegetation beds necessitating meticulous removal of a mat of rope-like, twisted vegetation from the prop. To the fisherman it could mean getting to and from a favorite fishing spot that may have been lost to vegetation years ago, as well as opening new areas to fishermen, pleasure boaters and water skiers. Most importantly, to the aquatic biologist the White Amur is a potential tool for better managing Louisiana's waters for the benefit of all. And, a review of the available literature on the Amur has indicated the species can effectively control most aquatic vegetation.

But as is always the case, there are inherent dangers associated with the introduction of any exotic species. The number of fish necessary for vegetation control is not known at this time, nor are the resulting effects of the Amur on the aquatic ecosystem clearly understood. The introduction of exotic fish species involves a risk of its utilization of the habitats of desirable native fish, and in the case of exotic herbivorous fish such as the White Amur, there is a risk of its exploitation of native aquatic vegetation and thus possible competition

THE WHITE AMUR

FRIEND OR FOE?

Story & Photography
by Louie Richardson

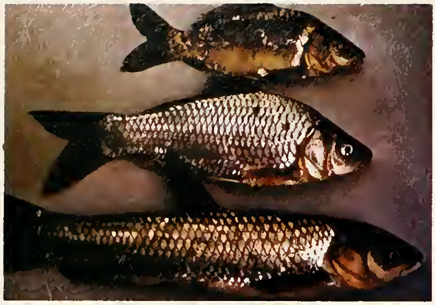
Aquatic Biologist

with waterfowl, furbearers and other native species dependent upon aquatic vegetation. Next time you're stalled in a weed bed or you've just lost the bass of a lifetime in a moss bed, remember, if you can, that all plants are not necessarily unwelcome or harmful. The problem lies in preserving the beneficial plant life while at the same time controling the weeds.

Aquatic weeds constitute a worldwide problem that is fast becoming critical because of expanded use and development of lakes, reservoirs, farm ponds, rivers and drainage and irrigation channels to accommodate a more affluent citizenry with more leisure time available to them. In Louisiana there are 6.4 million acres of fresh water wetlands, and of that 6.4 million, 1.5 million acres are in lakes and reservoirs over one square mile in size. There are at least 40 reservoirs 1,000 to 32,000 acres excluding Toledo Bend (a joint Louisiana-Texas reservoir of approximately 180,000 acres on the Sabine River) that offer outdoor recreational opportunities to the people of Louisiana. We have in our state a water to land ratio greater than any other state in the nation with 1 acre of water for every 11.5 acres of land. But we also have a severe submergent-emergent aquatic weed problem in parts of 35 of the 40+ reservoirs, and the areas that are free from weed problems are new reservoirs that haven't aged to that point as yet. Louisiana's mild climate renders 300-322 frostless days annually which are reponsible for long growing seasons. This factor, and the shallow water depths of our reservoirs, are conducive to lush growths of aquatic vegetation. Our interest in the elimination of aquatic weeds has led to development of a range of control techniques including preventive, biological, chemical and mechancial methods. These techniques are used in combinations for the restoration and maintenance of an aquatic balance, not simply to kill weeds.

So when we have a problem and seemingly a cure, why the extreme caution? Fears over the White Amur center on its reproductive habits. In the Old World the natural range of the White Amur is from latitude 50° north to latitude 23° north. When transposed to the North American continent, this range includes all of the contiguous 48 states, about half of Mexico and part of Canada. Most major rivers in Louisiana meet or exceed spawning requirements for the White Amur; therefore if both male and female fish are released, the species may reproduce in Louisiana's waters.

Due to a lack of scientific information there is no way of assessing the effects of a thriving wild popula-



(top) Israeli Carp, female; (center) Hybrid Offspring; (bottom) Amur, male.

Lloyd Poissenot

We need much more research before releasing the hybrid carp in our environment.

Lloyd Poissenot

To Commission biologists, the White Amur is a potential tool for the control of Louisiana's troublesome aquatic weeds.

tion of Amur on Louisiana's water resources at this time. Even limited releases of both sexes would be an irreversible decision if reproduction should occur. We need more research before we put the fish into our environment.

For these reasons, in June 1971 the Louisiana Wild Life and Fisheries Commission adopted the positions that the White Amur not be released in Louisiana waters; possession to continue to be prohibited by state law; first priority of research in Louisiana would be the development of sterile White Amur; and that any further research must be conducted with sterile fish. It is recognized that the fish does have a tremendous potential in helping solve weed control problems, so it was decided this was too important a discovery not to try to make use of alternatives under the guidelines.

Numerous contacts were made with individuals in other states involved in research with the White Amur to determine if any one was working on a sterilization process. One of the people most deeply involved with this particular aspect of research was Dr. Jon Stanley with the Bureau of Sport Fisheries and Wildlife, Department of the Interior. He was assigned the task of producing White Amur or White Amur-like fish which could not reproduce, an idea conceived by Mr. Kermit Sneed, also of the Bureau. Working at the Fish Farming Experimental Station located in Stuttgart, Arkansas, Dr. Stanley developed two possible solutions to his task—the production of monosex White Amur and the production of sterile hybrid fish.

Simply stated, monosex culture is the artificial spawning of a male and female with offspring being either all males or all females. The development of only females was the objective of the monosex culture. The process leading up to development of a mature male fish to breed with a female to produce only female offspring is very complex and is the most important single aspect of the monosex culture. Female fish produced through artificial gynogenesis (development of egg after fertilization with male sperm irradiated to destroy the capacity of the sperm to produce males) are fed sex reversal hormones prior to formation of sex organs. These harmones make male fish from female fish and the sex reversed females mature out as sexual males but carry chromosomes capable of producing only female fish. When paired with a mature female only female fish are produced.

Gynogenetic fish produced in 1972 and fed sex reversal hormones will be ready for breeding and production of female fish in 1975 or 1976. Monosex fish can be produced using ordinary hatchery production techniques, and are quite practical once gynogenesis and sex reversal has been achieved. The idea behind producing only female fish is, simply, the number of White Amur in Louisiana waters can be controlled. With no male fish present reproduction should not occur, and if, by a quirk of nature, the females were to spawn and the eggs be fertilized by wild carp, the offspring would be sterile hybrids, incapable of reproduction.

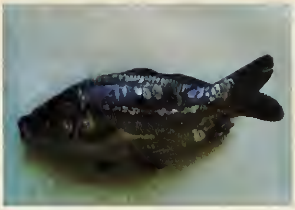
The Wild Life and Fisheries Commission is in the process of obtaining mature female White Amur from Arkansas which will be raised as brood fish for future production of monosex fish in Louisiana. We should have monosex fish by 1975 or 1976 at the latest, at which time we will initiate research programs to evaluate their effectiveness as biological aquatic weed control agents and their effects on the fisheries.

In line with the production of sterile hybrids, which is the other avenue we are exploring, we are using our laboratory equipment to cross a male fish of one species with a female fish of a different species. In May, 1972, Dr. Stanley successfully crossed female Israeli carp and male White Amur and produced hybrid fish. Due to the dif-

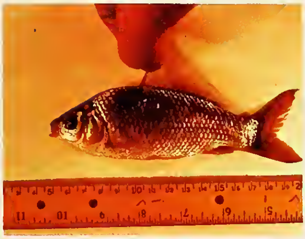
Lloyd Poissenot

Unlike the production of monosex carp, the production of hybrids is relatively simple.

James Manning



The primary question about this hybrid (Amur Israeli) is: will it eat aquatic plants?



The Israeli Carp.

ferences in chromosome numbers of each fish species, Israeli 104 and White Amur 48, it is highly improbable that these hybrids are capable of reproduction. A determination of reproductive capability will be made this year.

The production of hybrids is a relatively simple operation, and once the hybrid proves itself to be a valuable tool in managing Louisiana's water resources, we can go into production without any serious problems. Working under the assumption that the hybrids are safe insofar as reproduction is concerned, the primary question is: will they eat aquatic plants? Secondary answers needed would then be: what are their plant preferences and feeding habits; will they control aquatic weeds; and what effects will they have on our native fish population. In other words, would the hybrid—a new animal—retain the desirable features from the parent fish?

Hybrids were obtained from the Fish Farming Experiment Station in 1973 and delivered to LSU. The university has served as a holding reservoir for the fish. They are now readying facilities for research on effects of the hybrids on sport fish, crawfish, and aquatic plants in ponds, and the school will assist us in the research program.

Also in 1973, researchers at Northwestern University, Natchitoches, conducted food habit and plant preference studies using young, six inch hybrids. Through preliminary research they have found the hybrids would indeed eat aquatic plants and exhibit definite plant preferences. Feeding habits were more like the White Amur than the Israeli carp, and plant preferences were similar to those reported for the Amur. Northwestern plans a continuation this year of studies of plant food preference and feeding habits using 2-3 pound hybrids to discover if and how the habits change. The study completed last year and the continuation study were financed by two $5,000 grants from Placid Oil Company.

Researchers of Nicholls State University, Thibodaux, also conducted food preference studies during 1973 and their findings were similar to those reported from Northwestern. Nicholls plans to continue these studies and evaluate the effects of the hybrids on crawfish populations.

Biologists of the Fisheries Section and the Aquatic Plant Research and Control Section, Fish Division, recently initiated three studies around hybrid fish—hybrid production, effects of the hybrids on aquatic vegetation, evaluation of the hybrids' effects on fish populations in ponds. Limited numbers of hybrids will be produced in 1974 by Commission personnel for research studies.

It may seem that the Commission is moving slowly in regards to the future use of these fish for aquatic weed control in Louisiana's water—not an uncommon conclusion when a potential tool being researched receives widespread premature publicity. Early reports of limited findings from short term studies can easily give the public the idea that any one tool under consideration is *the* answer to a problem. In aquatic weed control there is no one answer: Our problems didn't develop over night and we can't expect to solve them over night. The answer will have to be the very careful integration of all tools available to obtain the desired results.

The Commission has taken a positive stand to safeguard Louisiana's aquatic systems and an aggressive stand to research *all* available tools which have indications of a potential to improve these systems. While we know the White Amur will not control water hyacinths and alligator weed, the fish does have a tremendous potential in helping solve problems with other aquatic weeds. Every effort is being exerted to make the best possible use of this opportunity to rid our waters of nuisance weeds.

Hopefully we have found our "Shmoo".

Hydrilla

The most serious threat to

Many of us are familiar with some of Louisiana's troublesome aquatic weeds such as water hyacinth, fanwort, coontail, water lilies, waterweed, and alligatorweed. The recent positive identification of the exotic plant Hydrilla (*Hydrilla verticillata*), (Casp.) in Spanish Lake, Iberia Parish and Sibley Lake, Natchitoches Parish represents a potential weed problem to all freshwater areas in Louisiana. The problem could become many times more serious than water hyacinths, other exotics, or any native submersed aquatic weed. Hydrilla's potential threat far exceeds any threat placed on the valuable water resources of Louisiana.

Aquatic plants include those plants which normally grow in water or have at least a portion of their life cycle in water. Algae are the original source of food for many fish and marine animals. Swamp smartweed, wild rice, wild millet, bulrushes and many other aquatic plants provide food and protection for waterfowl and some furbearers. Any aquatic plant can become an aquatic *wee*d if its presence interferes with the intended uses of an area.

Hydrilla was first discovered in the United States near Miami, Florida in 1960. The plant spread rapidly, and in 1967 it was reported to be the major submersed aquatic weed in Florida. Research scientists have observed and reported on the unusual growth characteristics of the plant and the difficulty of controlling it with aquatic herbicides.

Hydrilla is a submersed vascular aquatic plant, rooted to the bottom and having long, branching stems. Flowers arise from near the stem apex (tip) and are found at or near the water surface. The flower is very small (about the size of a match head) and located on the tip of a thread-like attachment to the plant.

Reproduction of Hydrilla is both vegetative and by bulbs. It is highly doubtful that seeds are formed. Broken shoots develop into new plants that attach themselves to the bottom by adventitious roots. The plant normally grows rooted to the bottom and increases in numbers by extending runners (stolons) along and below the bottom surface. Along the length of the bottom runners, lateral buds will germinate at nodes, grow and give rise to new plants. As these plants mature, new runners will be extended and increase the infestation of the area. The tip of the runners below the surface of the bottom undergoes a morphological change after a short period of growth. The tip, which is completely enclosed and protected by scale-like leaves, ceases its growth activity. This tip becomes swollen and enlarged from the buildup of starch granules. This enlarged tip portion of the runner has been termed a "turion". The turion, which is capable of germination and producing a normal plant, is believed to be one of the primary causes of reinfestation. It is protected from herbicides present in the water by the layer of soil above it and control treatments that kill the exposed plant have no apparent effect on the turion. The stored nutrients in the turion are sufficient to support growth for 85 days or longer in the complete absence of light.

Another type of turion is also produced by Hydrilla. This is the axillary turion and is developed in the leaf axil (where the leaf joins the stem) on the erect stem. It is very similar to the turion formed in the soil. Both are dormant vegetative buds capable of independent existences and survival when mature. The axillary turion, when mature, detaches from the plant and falls to the bottom where it may germinate and produce a new plant.

In Florida, Hydrilla tends to become the dominant aquatic weed when growing in association with other aquatics and soon renders the water body completely useless for any recreational or sport purposes. It has a wide range of adaptability and can grow in two foot candles of light (near darkness), which gives it the capability of growing at depths in excess of 35 feet. Florida officials have reported that 4.5 million dollars is being spent annually in an effort to control Hydrilla in the 50,000 plus acres of infested waters in that state.

THE SPANISH LAKE PROBLEM

Spanish Lake is a 1,240 acre impoundment located three miles north of New Iberia. It is a very shallow lake with a steadily declining fish population and is encompassed by a ring levee. In the past the ring levee offered excellent bank fishing opportunities. Water level is controlled by pumping water from Bayou Teche through the Daigre Canal.

Aquatic Plant Control biologists use an airboat to help them apply an approved herbicide over an area infested with the dreaded Hydrilla.

By Bob Johnson
and
James Manning

Aquatic Biologists

ouisiana's water resources

In July, 1973 researchers working with a University of Southwestern Louisiana aquatic weed research team brought in samples of what they believed to be waterweed, (*Egeria densa* Planchon), a submersed aquatic plant. University botanists soon identified the plant as the dreaded Hydrilla. Hydrilla very closely resembles waterweed and the untrained observer can not distinguish between the two plants. Researchers from Florida did not correctly identify Hydrilla until 1965. They state that positive identification of this plant is only possible with the presence of turions or flowers, the two most distinguishing characteristics.

Aquatic Plant Research and Control Section biologists immediately made a survey of Spanish Lake to determine the extent of infestation. Approximately three acres of infestation were recorded.

Commission biologists met with the members of the Spanish Lake Commission to inform them of the seriousness of the problem and to make recommendations for control measures. The Spanish Lake Commission adopted some of the recommendations of the Louisiana Wildlife and Fisheries Commission, which were as follows:

1) All access to the lake will be prohibited until further notice. This action was taken in an attempt to confine the infestation to its point of entry which was the canal where all boats are launched. The likelihood of boat traffic fragmenting the plant, thereby increasing the area of infestation, was the primary consideration in making this recommendation.
2) The water level of the lake be lowered 4 to 6 feet and held at that level until herbicide application and evaluation could be concluded. At this lowered level all of the infested area would have been exposed, allowing increased control by drying and direct application of herbicides to the plants. The lake commission agreed to lower the lake 3.5 feet.

Aquatic Plant Control biologists made an initial application of an approved herbicide over the infested area using airboat mounted equipment in August 1973. The primary area of infestation was fenced in with screen wire to prevent any treated plant fragments from entering and infesting the Bayou Teche system into which the lake drains.

A second herbicide application was made in November, 1973. Lack of a proper drawdown made it necessary to make the application to the few remaining plants in standing water. Turion production was noted during the second application.

An evaluation of Spanish Lake in January, 1974 by Commission biologists revealed only a very few plant fragments. At that time the lake commission re-opened the lake to the public. Spanish Lake remains under contant surveillance by Commission Biologists, and appropriate steps will be taken to retain control in the future.

THE SIBLEY LAKE PROBLEM

Sibley Lake is the water reservoir for the City of Natchitoches and a valuable recreational area for fishing, boating and skiing. Completed in 1962, the lake covers approximately 2,000 acres with a 38 mile shoreline and an average depth of 9 feet.

By act of the legislature, the water area became part of the Natchitoches City limits so that the City could control the water level and have authority over the use and management of the lake.

Specimens of Hydrilla were collected from Sibley Lake by graduate students from Northwestern State University in January, 1973. The absence of necessary taxonomic characters, particularly flowers or turions, to distinguish this plant from waterweed prevented a positive identification until August, 1973. In August, 1973, a positive identification of the plant was made, and a survey by Aquatic Plant Control biologists and Northwestern State University aquatic plant research personnel indicated approximately 12 acres of top matted plants in the northwest arm of the lake. Underwater inspection with SCUBA revealed dense stands of the plant from the end of the northwest arm to a depth of 6½ feet. Beyond this point Hydrilla was mixed with waterweed to a depth of 9½ feet. Inspection of the north and south banks of the infested arm to the point of confluence with the main body of the lake revealed scattered plants to depths of 4½ feet. Scattered plants were found at both boat launching ramps. They were transported from the infested area by boats. A severe infestation of waterweed was recorded in the end of the southwest arm and along the banks. In October, 1973 bottom core samples were taken in the Hydrilla mats to determine if turions were present. At this time the plants had begun flowering. No turions were found; however, the area of top matted infestation had more than doubled in area in only 6 weeks.

What did all this mean to Sibley Lake? It indicated that:

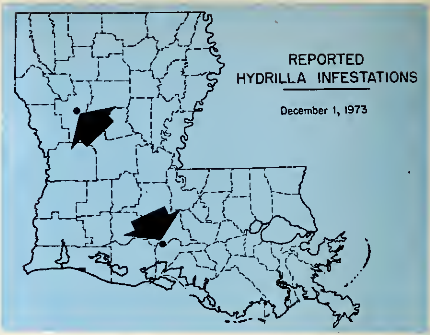
1. Hydrilla could grow in the deepest areas of the lake.
2. Hydrilla could completely destroy recreational uses of the lake.
3. The amount of water available to the City of Natchitoches would be drastically reduced due to increased evaporation and volumetric displacement by the plant.
4. Adverse taste and odor problems could arise.
5. Fish populations would be greatly reduced.
6. Secondary aquatic weeds such as algae and watermeal would become established.

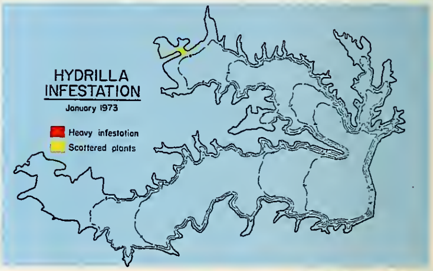
In October, 1973 Commission biologists met with the Natchitoches City Council to present recommendations for the control of Hydrilla in Sibley Lake.

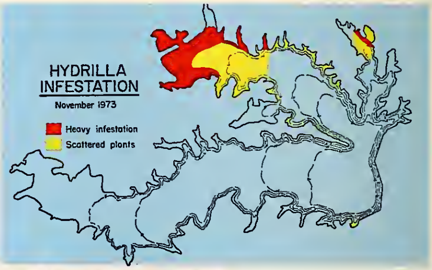
Based on available knowledge and information, and after careful consideration of various alternatives, the following recommendations were submitted:

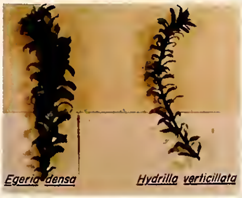
1. Lower the water level 9 feet and apply a diquat and copper sulfate herbicide combination to the remaining infested waters. As the lake is lowered, a 2,4-D herbicide overspray would be applied to the freshly exposed plants to enhance the killing effect of the drawdown.
2. Lower the water level 6 feet and treat as in the primary recommendation.
3. Close the northwest arm of the lake to all powered boat traffic to prevent further spreading.
4. The Louisiana Wildlife and Fisheries Commission would cooperate to the fullest extent possible during control operations. After procurement of the necessary herbicides by the City (cost, approximately $21,000), the Commission would assume the responsibility of the herbicide application.

The Natchitoches City Council agreed to a 7 foot drawdown which began October 31, 1973. The lake was maintained at this lowered level until January 15, 1974, at which time it was allowed to refill.









Hydrilla, with its tremendous capabilities for regeneration, is probably in Louisiana to stay.

Commission personnel began 2,4-D overspray operations using airboats and an all terrain vehicle shortly after drawdown began. The airboats proved to be an invaluable tool in this type of operation. They were extremely useful in traversing the exposed mudflats and banks to the many infested potholes requiring treatment. This daily operation continued until the drawdown was completed in late November.

At this time the second phase of the treatment began. Approximately 60 acres of Hydrilla infested water remained to be treated. A barge was towed to the infested area to be used as a working platform for the mixing and transfer of the herbicides to the airboat for application. The infested waters were measured and marked using colored buoys. To compute the amount of herbicide required for proper concentration, average depths were calculated for each measured area.

The aquatic herbicides were applied utilizing two commission airboats equipped with stem nozzles to inject the herbicides beneath the surface of the water. Each area was treated using these airboats.

The operation was completed and in December, 1973 preliminary investigation revealed very good results from both phases of the operation. The plants exposed by the drawdown were rapidly decomposing although the expected drying and freezing conditions were not obtained. Plants remaining in the watered areas exhibited serious herbicide damage.

The control gates were closed in mid-January, 1974 and heavy rains allowed the lake to refill in eleven days. The rapid refilling and high turbidity levels should enhance the control obtained.

Florida studies indicate regrowth from turions and plant fragments usually begins 4 to 6 months after herbicidal treatment. Commission biologists are periodically monitoring Sibley Lake to determine where spot treatments will be necessary this year.

It would have been ideal to eradicate this aquatic weed species from Louisiana's waterways, but Hydrilla, with its tremendous capabilities for regeneration, is probably here to stay. We in Louisiana Wildlife and Fisheries Commission must maintain continuous surveillance over all fresh waterways to detect Hydrilla in its earliest stages of growth. All aquarium owners should be aware of the fact that Hydrilla is most often transported and sold as an aquarium plant. Its entry into the United States and Louisiana was probably by this means.

CONTROL OF AQUATIC WEEDS

Each weed control practice has problems peculiar to its own operation. This is particularly true of aquatic weed control since almost every body of water has multiple uses. The usually simple decision of whether or not to treat with herbicides becomes extremely complex when the movement and use of water is a factor.

Because the aquatic situation is fluid, herbicides will not remain in place. Attempts have been made to overcome this problem through the use of special formulations and application techniques, but chemical action requires solubility of a herbicide, and as long as a herbicide is soluble, mobility will be a problem in aquatic situations.

Aquatic weed control is further complicated because there is rarely absolute ownership or absolute control of a body of water. Multiple interest must be considered.

Louisiana annually has 300-322 frostless days which are conducive to lush growths of aquatic vegetation. Interest in the elimination of aquatic weeds has led to development of a range of control techniques including preventive, biological, chemical and mechanical. These four techniques are used in combinations for the restoration and maintenance of an aquatic balance, not simply to kill weeds.

The most singly important type of control is preventive. Careful planning in the construction of reservoirs as well as thoughtful consideration for future management practices can be used in preventing aquatic weeds or facilitating their control.

Chemical control of most aquatic weeds can be accomplished with the aid of selected herbicides. Chemical control is only a temporary control measure on most aquatic weeds. The high cost of $30-$200/acre for chemicals per treatment, makes it most unfeasible on a cost/benefit ratio. Complete control using herbicides is not the answer to weed control.

Large scale mechanical control has not proven feasible. Cost on a per acre basis (up to $1500 per acre) as well as the increase of the infestation effect by stem fragments of cutting, overrides any temporary benefits. Harvesting is a perpetual operation and has proven beneficial only where interested individuals keep their camp area under continual maintenance.

Biological control is a selective form of control and has to be considered a calculated risk. Generally speaking, there are two forms of biological control. One is the manipulation of the environment to the extent where the plants cannot survive. The other is the use of organisms which utilize the plants in their life cycle to such an extent as to maintain control.

The manipulation of the environment to the extent where the plant cannot survive is presently the most effective control for submersed aquatics. This can be accomplished by two methods: either increase the water depth or fluctuate the water at certain times of the year (drawdown).

The Louisiana Wildlife and Fisheries Commission has utilized the drawdown for many years in helping control aquatic weeds and reestablishing fish populations and balance. The most important aspects of utilizing the drawdown for weed control are the target plant to be controlled, the amount of water left in the reservoir less than 18 inches deep, the length of time and time of year the area is drawn down.

Control procedures in any area should always be selected after seriously considering *all* possible effects of the removal of the weeds and all possible effects of the technique being used on the ecology of the habitat.

PIE'S POTPOURRI

By Marian "Pie" Pendley

When your father is the chef in a well known. New York restaurant, it can be a traumatic experience for a young girl learning to master the culinary arts. But Mrs. Sherman Bernard, wife of the Commissioner of Insurance of Louisiana, felt she had passed the test when she prepared seafood gumbo for her father . . . and received his compliments.

Julie Bernard admits she was not too interested in cooking until she married—perhaps because she felt her father was looking over her shoulder. She says she was always petrified to cook for him, knowing she could never attain his perfection.

"Sherman enjoys puttering in the kitchen," Julie says "and one of his specialties is Oyster Spaghetti." Actually this is his version of a recipe given to us by my father in which he used clams. It is easy to prepare and goes like this:

OYSTER SPAGHETTI

1 lb. of spaghetti (#4 or #3)
1 can of pear shaped tomatoes
(1 lb. 12 oz. size)
(chopped fine or sieved)
2 tbsp. of oregano
2 tbsp. of sweet basil leaves
(fresh if available)
2 tbsp. of finely chopped garlic
½ cup cooking oil
1 medium size can of tomato sauce
(16 oz.)
2 pint jars of oysters
(can be chopped or used whole)

Place oil and garlic in large skillet and heat till garlic turns light brown. Add drained oysters (save juice) and brown slightly. Add tomatoes, tomato sauce and oyster juice and cool for approximately 10 to 15 minutes. Add sweet basil and oregano, salt and pepper and cook for five more minutes or till desired consistency is reached.

Boil spaghetti in salted water for approximately seven minutes. Drain, place in dish and cover with sauce.

The Bernards both enjoy fishing and Mrs. Bernard points with pride to a 120 lb. sailfish that she caught in Mexico and has mounted on the den wall. They also keep an ample supply of fish in the freezer which they prepare in a variety of ways. One of the favorites is blue fish and it is prepared in this manner:

BAKED BLUE FISH

1 4 lb. fish (filet)
2 cups chopped fresh sweet basil
2 cups chopped fresh parsley
5 tbsp. of finely chopped garlic
½ cup of parmesan cheese
2 or 3 cups of french bread crumbs
½ cup of olive oil
1 tsp. of salt
½ tbsp. of cayenne pepper

Place fish in baking dish. Salt and pepper and baste with oil. Mix all above ingredients with oil and place on top of fish. Bake 15 to 20 minutes in 350° oven. Serve garnished with lemon slices.

Although they are especially fond of fish, the Bernards also enjoy game and their favorite is the Bob-White quail, considered the Prince of upland game birds. Ducks and venison are also keenly enjoyed.

The deep South's most venerated game bird needs special attention in the kitchen.

BAKED QUAIL

6 quail
½ cup cooking oil
1 tsp. salt
1 tsp. of pepper (red or black)
1 tbsp. of cornstarch mixed in 1 glass of water
1 or 2 medium size cans of sliced mushrooms
1 cup of white wine

Lightly cover quail with oil, salt and pepper. Place in open pan and bake in 450° oven till brown on both sides. Baste birds with wine, cover and cook till tender. During the cooking process baste birds with wine several times and then cover till done. Remove quail from baking pan, and pour off all excess grease from pan. Add the cornstarch mixture and mushrooms in pan to make gravy and cook till desired consistency is reached. May be served with rice or dressing of your choice.

Mrs. Bernard is really an accomplished chef in her own right, though she is reluctant to admit it. She owned and operated a family restaurant for a short time and also operated a successful catering service. The training she received from her father came in handy, however she did admit to using short cuts . . . "Something my father would definitely frown on. For example, my pineapple upside down cake is made with a 'mix' and is prepared like this:"

PINEAPPLE UPSIDE DOWN CAKE

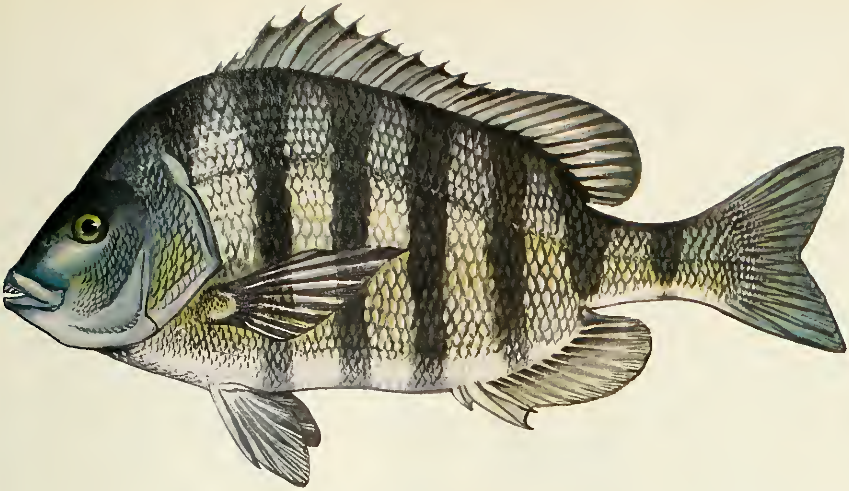
1 box cake mix (yellow)
1 medium size can sliced pineapple
1 small jar maraschino cherries
1 cup chopped pecans
1 stick butter or margarine
2 cups dark brown sugar

Grease cake pan with half stick of butter. Pack brown sugar at bottom of pan. Place drained pineapple slices and cherries over brown sugar and scatter the remaining half stick of butter over all. Prepare cake mix as per instructions and pour over ingredients in pan. Bake in 350° oven 25 to 30 minutes.

The five Bernard children are all at home in the kitchen. Their heritage is French and Italian, so their cooking is sprinkled with the seasonings of their combined nationalities.

In teaching her children to cook, Julie Bernard always stresses the philosophy her father taught her. One important lesson is that proper utensils, including thickness and size, are just as important as the finest ingredients. This is particularly true of ingredients that must be simmered for long periods of time, others that are to be sautéed, and those which should be brought to a quick boil.

Even though French and Italian dishes are specialties with the family, they are always willing to experiment with appealing recipes, so there's no telling what enticing aromas will be wafting throughout the house from the kitchen on any given day of the week.



FISH OF LOUISIANA

ILLUSTRATED BY DUANE RAVER, JR.

SHEEPSHEAD

The Sheepshead is one of the more abundant species along the Louisiana coast and is considered a valuable food and game fish all year round. Scientifically christened *Archosargus probatocephalus* by the American Fisheries Society, the Sheepshead is a dull, silvery-green color, darker above than below, with five to six distinct, dark vertical bars on the side which give the species the sometimes used common name of "convict fish." The body of the species is deep and he has a small mouth with notched incisor teeth in front and crushing molar back teeth. His tail fin is forked and he has a long dorsal fin with strong spines.

This striped bandit, as he is sometimes called, swims in groups but not in regular schools. They tend to gather in large groups when feeding and spend much of their time around wrecks and other obstacles in the water. Anglers will have their best luck fishing the rigs, and in the vicinity of pilings, buoys and bridges where they graze on barnacles and marine growth. They present a real challenge to catch and some sport fishermen specialize in them for this reason. You can expect them to be swimming at about mid-depth in the water, as they are neither a top nor bottom fish, but they are a suspicious quarry and often they will steal your bait without you ever knowing it.

Some experienced anglers suggest chumming the area in which you have located the sheepshead with crushed fiddler crabs to stir them into feeding. Fiddler crabs, hermit crabs, shrimp and sandbugs are popular baits; they rarely will display an interest in artificial lures, as they prefer natural baits. Fish them with a light spinning rod or other light tackle and a small hook. The hook should be a stout one because sheepshead are equipped with a good set of teeth capable of crushing a clam with ease. This same power can easily straighten out a thin hook.

Sheepshead should be regarded more as a food fish than a game fish, even though they offer good sport on light tackle. Most people prefer to bake them but quite a few persons are learning that when cleaned and boiled, the flesh is easily flaked off and greatly resembles crab meat. This can be mixed with crab meat and served with cocktail sauce. Few persons can tell the difference. It can also be fashioned into fish cakes.

Knowledge of the fish and its habitat preferences as well as its feeding habits is essential for anglers who fish for sheepshead. Like the pompano, a sheepshead will approach a baited hook with caution and gently nibble on the bait. Unless the angler is alert to this light, almost unnoticeable nibbling, the fish will work the bait loose and move away in search of other food. The trick is to set the hook immediately when the first gentle nibbling indicates there is a fish toying with the bait.

On the record side of the issue, John N. Bourg still maintains the top Louisiana title for his fourteen pound twelve ounce Sheepshead landed in May of 1970. Although there is no established international record on this striped bandit, Louisianians continue to enjoy angling for him along our coast and we're hoping he'll be listed in IGFA competition in the not too distant future.

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